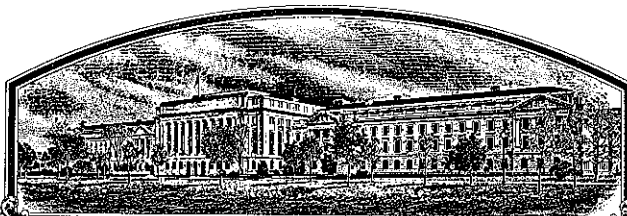


No.

9200218



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Pioneer Hi-Bred International, Inc.

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED, PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE FOREGOING PURPOSES, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

ALFALFA

'5454'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this thirty-first day of August in the year of our Lord one thousand nine hundred and ninety-five.

Attest:

[Signature]

Acting Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

[Signature]
Secretary of Agriculture

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE
(Instructions on reverse)

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) (as it is to appear on the Certificate) Pioneer Hi-Bred International, Inc.		2. TEMPORARY DESIGNATION OR EXPERIMENTAL NO. XAL06	3. VARIETY NAME 5454
4. ADDRESS (street and no. or R.F.D. no., city, state, and ZIP) 7305 N. W. 62nd Ave., P. O. Box 287 Johnston, IA 50131		5. PHONE (include area code) 515-270-3340	FOR OFFICIAL USE ONLY PVPO NUMBER 9200218
6. GENUS AND SPECIES NAME Medicago sativa	7. FAMILY NAME (Botanical) Leguminosae	FILING Date June 22, 1992 Time 1:18 <input type="checkbox"/> A.M. <input checked="" type="checkbox"/> P.M.	
8. CROP KIND NAME (Common Name) Alfalfa	9. DATE OF DETERMINATION August, 1988	FEE Filing and Examination Fee: \$ 2150.00 Date June 19, 1992	RECEIVED Certificate Fee: \$ 250.00 Date May 31, 1995
10. IF THE APPLICANT NAMED IS NOT A "PERSON," GIVE FORM OF ORGANIZATION (Corporation, partnership, association, etc.) Corporation		11. IF INCORPORATED, GIVE STATE OF INCORPORATION Iowa	
12. DATE OF INCORPORATION 1926			

13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS
William T. W. Woodward, 7305 N. W. 62nd Ave., P. O. Box 287, Johnston, IA 50131
John Hintze, 700 Capital Square, 400 Locust Street, Des Moines, IA 50309
Mike Roth, 700 Capital Square, 400 Locust Street, Des Moines, IA 50309

PHONE (include area code):

14. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow INSTRUCTIONS on reverse)

a. ☒ Exhibit A, Origin and Breeding History of the Variety.
b. ☒ Exhibit B, Novelty Statement.
c. ☒ Exhibit C, Objective Description of Variety.
d. ☒ Exhibit D, Additional Description of Variety.
e. ☒ Exhibit E, Statement of the Basis of Applicant's Ownership.
f. ☒ Seed Sample (2,500 viable untreated seeds). Date Seed Sample mailed to Plant Variety Protection Office 6-8-92
g. ☒ Filing and Examination Fee (\$2,150) made payable to "Treasurer of the United States."

15. DOES THE APPLICANT(S) SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? (See section 83(a) of the Plant Variety Protection Act.)
☐ YES (If "YES," answer items 16 and 17 below) ☒ NO (If "NO," skip to item 18 below)

16. DOES THE APPLICANT(S) SPECIFY THAT THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?
☐ YES ☐ NO

17. IF "YES" TO ITEM 16, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED?
☐ FOUNDATION ☐ REGISTERED ☐ CERTIFIED

18. DID THE APPLICANT(S) PREVIOUSLY FILE FOR PROTECTION OF THE VARIETY IN THE U.S.?
☐ YES (If "YES," through ☐ Plant Variety Protection Act ☐ Patent Act. Give date: _____.)
☒ NO

19. HAS THE VARIETY BEEN RELEASED, USED, OFFERED FOR SALE, OR MARKETING IN THE U.S. OR OTHER COUNTRIES?
☐ YES (If "YES," give names of countries and dates)
☒ NO

20. The applicant(s) declare(s) that a viable sample of basic seeds of this variety will be furnished with the application and will be replenished upon request in accordance with such regulations as may be applicable.

The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced novel plant variety, and believe(s) that the variety is distinct, uniform, and stable as required in section 41, and is entitled to protection under the provisions of section 42 of the Plant Variety Protection Act.

Applicant(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF APPLICANT (Owner(s)) PIONEER HI-BRED INTERNATIONAL, INC.	CAPACITY OR TITLE	DATE
SIGNATURE OF APPLICANT (Owner(s)) By <u>W.T.W. Woodward</u>	Director, Department of Alfalfa Breeding	6-8-92

EXHIBIT A

ORIGIN AND BREEDING HISTORY OF THE VARIETY

'5454'

5454 is a 12 clone synthetic with clones replicated in "cage isolation". Seed was harvested from each clone and bulked in equal quantities to produce Syn 1 prebreeder seed. Syn 2 seed harvested from 200 random plants in "cage isolation" in 1988 is considered breeder seed. One or more of the parental clones were selected on the basis of clonal evaluation for forage and seed yield, bacterial wilt, anthracnose, Phytophthora root rot, Verticillium wilt, spotted alfalfa aphid, pea aphid and stem nematode. Clonal selection for forage yield was based on OP progeny row tests harvested over several locations. Parental clones trace back through several intermediate experimental lines to Apollo, NCMP-1, Saranac AR, Anchor, Atra 55, 532, 521, 531, 520, 530, DuPuits, Vernal, Narragansett, Culver, Maryland, Dawson, Iroquois, MSA and other germplasms with minor contributions. Germplasm sources are: *M. falcata* (2%), Ladak (3%), *M. varia* (14%), Turkistan (2%), Flemish (41%), Chilean (2%), with (36%) unknown.

5454 has been stable and uniform over time with traits being stable over 3 generations of seed multiplication. Multiplication procedures will insure that seed being sold as 5454 will not be shifted in characteristics beyond presently acceptable limits for alfalfa varieties. Syn 2 seed harvested from individual plants in "cage isolation" in 1988 is considered breeder seed.

It is confirmed that 5454 meets presently acceptable levels for uniformity for alfalfa varieties.

EXHIBIT B**NOVELTY STATEMENT****'5454'**

5454 most clearly resembles the variety '5364'. 5454 differs from 5364 in anthracnose resistance, being classified as having high resistance, while 5364 has moderate resistance to the disease as shown below.

DISEASE RESISTANCE	Variety	Syn. Gen.	Percent Resistant Plants	Number of Plants Tested	A S I	ASI LSD .05	Institution Year, Location, Field or Laboratory
Anthracnose, Race 1 (Colletotrichum trifolii)	Application HR	2	73.0	~300		% Resistant plants 18.4	Pioneer Hi-Bred International, Inc. Johnston, IA Laboratory 1989
	ARC (HR)		65.0	~300			
	Saranac (S)		0.0	~300			
	5364 (MR)		19.5	~300			

Scoring system: Percent surviving seedlings. Data adjusted to ARC at 65% resistant plants by Pioneer Hi-Bred International, Inc.

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK AND SEED DIVISION
PLANT VARIETY PROTECTION OFFICE
BELTSVILLE, MARYLAND 20705

EXHIBIT C
(Alfalfa)

OBJECTIVE DESCRIPTION OF VARIETY
ALFALFA (*Medicago sativa* sensu Gunn et al.)

NAME OF APPLICANT(S) Pioneer Hi-Bred International, Inc.	TEMPORARY DESIGNATION XAL06	VARIETY NAME 5454
ADDRESS (Street and No., or R.F.D. No., City, State, and Zip Code) 7305 N. W. 62nd Ave., P. O. Box 287 Johnston, IA 50131		FOR OFFICIAL USE ONLY PVPO NUMBER 9200218

PLEASE READ ALL INSTRUCTIONS CAREFULLY: Place numbers in the boxes to designate the expressions which are characteristic of the commercial generations of the application variety. Data for quantitative plant characters should be based on a minimum of 100 plants. Include leading zeros when necessary (e.g.,) for quantitative data. Comparative data should be determined from varieties entered in the same trial. Plant color may be precisely designated by using any recognized color chart, e.g., The Munsell Plant Tissue Color Charts.

1. WINTERHARDINESS:

- CLASS:
- | | |
|--|--------------------------------------|
| 1 = Very Non-Winterhardy (CUF 101) | 2 = Non-Winterhardy (Moapa 69) |
| 3 = Intermediately Non-Winterhardy (Mesilla) | 4 = Semi-Winterhardy (Lahontan) |
| 5 = (Du Puits) | 6 = Moderately Winterhardy (Saranac) |
| 7 = (Ranger) | 8 = Winterhardy (Vernal) |
| 9 = Extremely Winterhardy (Norseman) | |

TEST LOCATION: Markesan, WI; Arlington, WI

2. FALL DORMANCY:

FALL DORMANCY (DETERMINED FROM SPACED PLANTINGS)

TESTING INSTITUTION AND LOCATION	DATE OF LAST CUT	DATE REGROWTH SCORED	REGROWTH SCORE OR AVERAGE HEIGHT				LSD .05
			APPLICATION VARIETY	CHECK VARIETIES*			
				Vernal	Ranger	Saranac	
Pioneer Hi-Bred International, Inc. Johnston, IA	9/90	10/90	11.3	8.4	9.7	11.8	1.4

* CUF 101, Moapa 69, Mesilla, Lahontan, Du Puits, Saranac, Ranger, Vernal, or Norseman as appropriate.

Specify scoring system used: Average height in cm of space plants; six replications

- Fall Growth Habit (Determined from Fall Dormancy Trials)

- | | | |
|----------------------------|--------------------------|----------------------------|
| 1 = Erect (CUF 101) | 3 = Semierect (Mesilla) | 5 = Intermediate (Saranac) |
| 7 = Semidecumbent (Vernal) | 9 = Decumbent (Norseman) | |

3. RECOVERY AFTER FIRST SPRING CUT (In Southwest, first cut after March 21):

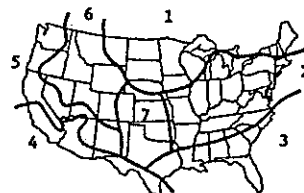
- 1 = Very Fast (CUF 101) 3 = Fast (Saranac) 5 = Intermediate (Ranger) 7 = Slow (Vernal)
9 = Very Slow (Norseman)

TEST LOCATION: Johnston, IA; Quarryville, PA

4. AREAS OF ADAPTATION IN U.S. (Where tested and proven adapted):

- Primary Area of Adaptation Other Areas of Adaptation

- | | | | |
|--|-------------------------------|------------------|---------------|
| 1 = North Central | 2 = East Central | 3 = Southeast | 4 = Southwest |
| 5 = Moderately Winterhardy Intermountain | 6 = Winterhardy Intermountain | 7 = Great Plains | |
| 8 = Other (Specify) _____ | | | |



5. FLOWERING DATE (When 10% of plants possess open flowers at time of first spring cut):

- | | | | | | |
|---|---|-------------|-------------|-------------|--------------|
| <input type="text" value="0"/> <input type="text" value="0"/> Days Earlier Than | <input type="text" value="0"/> <input type="text" value="0"/> | | | | |
| Same As | <input type="text" value="0"/> <input type="text" value="0"/> | 1 = CUF 101 | 2 = Mesilla | 3 = Saranac | 4 = Vernal |
| <input type="text" value="0"/> <input type="text" value="0"/> Days Later Than | <input type="text" value="0"/> <input type="text" value="0"/> | | | | 5 = Norseman |

TEST LOCATION: _____

6. PLANT COLOR (Determined from healthy regrowth 3 weeks after first spring cut, controlling leafhoppers if necessary):

9200218

☐ 1 = Very Dark Green (524) 2 = Dark Green (Vernal) 3 = Light Green (Ranger)

COLOR CHART VALUE (Specify chart used; _____)

APPLICATION VARIETY: _____

VERNAL: _____

TEST LOCATION: _____

7. CROWN TYPE (Determined from spaced plantings):

☒ 2 Noncreeping Types: 1 = Broad (Vernal) 2 = Intermediate (Saranac) 3 = Narrow (CUF 101)

Creeping Types: 4 = Creeping Rooted (Rangelander) 5 = Rhizomatous (Rhizoma)

8. FLOWER COLOR (Determine frequency of plants for each color class as defined by USDA Agricultural Handbook No. 424 (Barnes 1972), allowing all plants in plot to flower):

% Purple and Violet (Subclasses 1.1 to 1.4) % Blue (Subclasses 2.3 and 2.4)

% Variegated Other Than Blue (Subclasses 2.1, 2.2, 2.5 to 2.9) % Yellow (Subclasses 4.1 to 4.4)

% Cream (Class 3) % White (Class 5)

TEST LOCATION: Johnston, IA; Connell, WA

9. POD SHAPE (Determine frequency of plants with the following pod shapes produced on well cross-pollinated racemes):

% Tightly Coiled (One or more coils, center more or less closed) % Loosely Coiled (One or more coils, center conspicuously open)

% Sickle (Less than 1 coil)

TEST LOCATION: _____

10. PEST RESISTANCE: Provide in the appropriate column, trial data for application variety, and resistant (R) and susceptible (S) check varieties, synthetic generation tested, average severity index scores (ASI), least significant difference statistics (LSD .05), the institution in charge of test, year, and location of test, and whether test is a field or laboratory evaluation. Describe scoring system, and any test procedure which differs from standard methods proposed by Elgin (1982). Trial data from other test years or locations should be presented whenever available on a separate document as Exhibit D. Seeds of the check varieties and germplasm lines listed below can be obtained from the USDA Field Crops Laboratory, Bldg. 001, Rm. 335, BARC-West, Beltsville, MD 20705. Although comparisons with check varieties listed below are preferred, comparisons with any appropriate check variety recommended by Elgin (1982) may be presented.

A. DISEASE RESISTANCE:	DISEASE	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Anthracnose, Race 1 (<i>Colletotrichum trifolii</i>)	Application	HR	2	73.0	~300		% Resistant plants 18.4	Pioneer Hi-Bred International, Inc. Johnston, IA Laboratory 1989
	Arc (R)			65.0	"			
	Saranac (S)			0.0	"			
	SCORING SYSTEM: Percent surviving seedlings. Data adjusted to ARC at 65% resistant plants by Pioneer Hi-Bred International, Inc.							
Anthracnose, Race 2 (<i>Collectotrichum trifolii</i>)	Application							
	Saranac AR (R)							
	Arc (S)							
	SCORING SYSTEM:							
Bacterial Wilt (<i>Corynebacterium insidiosum</i>)	Application	R	2	47.8	~225	2.18	0.45 % Resistant Plants 16.5	University of Minnesota Rosemount, MN Field 1991
	Vernal (R)			42.0	"	2.22		
	Narragansett (S)			0.8	"	4.00		
	SCORING SYSTEM: Plants scored 0 and 1 (on a 0-5 scale, where 0=no disease and 5=dead plant) considered resistant. Data adjusted to Vernal at 42% resistant plants							
Common Leafspot (<i>Pseudopeziza medicaginis</i>)	Application		by the University of Minnesota					
	MSA-CW3AN3 (R)							
	Ranger (S)							
	SCORING SYSTEM:							

10. A. PEST RESISTANCE (Continued):

DISEASE	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Downy Mildew (<i>Peronospora trifoliorum</i>)	Application						
Isolate, if known:	Saranac (R)						
	Kanza (S)						
SCORING SYSTEM:							
Fusarium Wilt (<i>Fusarium oxysporum</i> f. <i>medicaginis</i>)	Application HR	2	59.3	~225	2.37	0.66	University of Minnesota
	MNGN-1 (R)		54.0	"	2.71	% Resistant	1991
	MNGN-1 (S)		5.1	"	4.69	Plants	Rosemount, MN
SCORING SYSTEM: Plants scored 0 and 1 (on a 1-5 scale where 0=no disease and 5=dead plant) considered resistant. Data adjusted to Agate at 54% resistant plants by the University of Minnesota							
Phytophthora Root Rot (<i>Phytophthora megasperma</i> f. <i>medicaginis</i>)	Application HR	2	56.5	~225		% Resistant	Pioneer Hi-Bred International, Inc.
	Agate (R)		43.0	"		17.7	1989
	Saranac (S)		4.8	"			Quarryville, PA
SCORING SYSTEM: Percent healthy seedlings. Data adjusted to Agate at 43.0% resistant plants by Pioneer Hi-Bred International, Inc.							
Verticillium Wilt (<i>Verticillium albostrum</i>)	Application MR	2	22.8	~225	2.69	0.55	Pioneer Hi-Bred International, Inc.
	Vertus (R)		40.8	"	3.16	% Resistant	1989
	Saranac (S)		3.9	"	1.60	Plants	Arlington, WI
SCORING SYSTEM: Plants scored 5-9 (on a 1-9 scale where 9=no disease and 1=dead plant) considered resistant. Data adjusted to Vertus at 40% resistant plants by Pioneer Hi-Bred International, Inc.							
Other (Specify) APHANOMYCES ROOT ROT	Application LR	2	8.3	~225	3.01	0.70	Pioneer Hi-Bred International, Inc.
	(R) WAPH-1 R		50.0	"	5.56	% Resistant	1990
	(S) Agate S		1.2	"	1.82	Plants	Arlington, WI
SCORING SYSTEM: Plants scored 7-9 (on a 1-9 scale where 9=no damage to roots or hypocotyls and 1=dead plant) considered resistant. Data adjusted to WAPH-1 at 50% resistant plants by Pioneer Hi-Bred International, Inc.							
Other (Specify)	Application						
	(R)						
	(S)						
SCORING SYSTEM:							
B. INSECT RESISTANCE:	VARIETY	SYN. GEN. TESTED	PERCENT DEFOLIATION	DEFOLIATION IN PERCENT OF RESISTANT CHECK	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
INSECT							
Alfalfa Weevil (<i>Hypera postica</i>)	Application						
	Arc (R)			100			
	Saranac (S)						
SCORING SYSTEM:							

10. B. INSECT RESISTANCE (Continued):

INSECT	VARIETY	SYN. GEN. TESTED	PERCENT SEEDLING SURVIVAL	NUMBER OF SEEDLINGS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Blue Alfalfa Aphid (<i>Acyrtosiphon kondoi</i>)	Application						
	CUF 101 (R)						
	PA-1 (S)						
	SCORING SYSTEM:						
Pea Aphid (<i>Acyrtosiphon pisum</i>)	Application R	2	44.3	~225		% Resistant Plants	Pioneer Hi-Bred International, Inc. 1991 Johnston, IA Laboratory
	Kent Baker (R)		45.0	"			
	Pioneer Vernal (S)		4.0	"		10.2	
	SCORING SYSTEM: Plants scored 5-9 (on a 1-9 scale where 9=tall, symptomless plant and 1=dead plant) considered resistant. Data adjusted to Baker at 45% resistant plants by Pioneer Hi-Bred International, Inc.						
Spotted Alfalfa Aphid (<i>Therioaphis maculata</i>) Biotype, if known:	Application R	2	42.2	225		% Resistant Plants	Pioneer Hi-Bred International, Inc. 1991 Kerman, CA Laboratory
	Kent Baker (R)		50.0	"		14.4	
	Kent Arc (S)		0.0	"			
	SCORING SYSTEM: Plants scored 5-9 (on a 1-9 scale where 9=no damage and 1=dead plant) considered resistant. Data adjusted to Baker at 50% resistant plants by Pioneer Hi-Bred International, Inc.						
INSECT	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Potato Leafhopper Yellowing (<i>Empoasca fabae</i>)	Application						
	MSA-CW3An3 (R)						
	Ranger (S)						
	SCORING SYSTEM:						
Other (Specify)	Application						
	(R)						
	(S)						
	SCORING SYSTEM:						

C. NEMATODE RESISTANCE:

NEMATODE	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Northern Root Knot (<i>Meloidogyne hapla</i>)	Application						
	Nev. Syn. XX (R)						
	Lahontan (S)						
	SCORING SYSTEM:						

10. C. NEMATODE RESISTANCE (Continued):

NEMATODE	VARIETY	SYN. GEN. TESTED	PERCENT RESISTANT PLANTS	NUMBER OF PLANTS TESTED	ASI	ASI LSD .05	INSTITUTION, YEAR, LOCATION, FIELD OR LABORATORY
Southern Root Knot (<i>Meloidogyne incognita</i>)	Application						
	Moapa 69 (R)						
	Lahontan (S)						
	SCORING SYSTEM:						
Stem Nematode (<i>Ditylenchus dipsaci</i>)	Application MR	2	28.9	~225		% Resistant Plants	Pioneer Hi-Bred International, Inc. 1990 Connell, WA Laboratory
	Lahontan (R)		50.0	"			
	Ranger (S)		9.5	"			
	SCORING SYSTEM: Plants scored 5-9 (on a 1-9 scale where 9=no symptoms and 1=dead plant) considered resistant. Data adjusted to Lahontan at 50% resistant plants by Pioneer Hi-Bred International, Inc.						
Other (Specify)	Application						
	(R)						
	(S)						
	SCORING SYSTEM:						

11. INDICATE THE VARIETY THAT MOST CLOSELY RESEMBLES THE APPLICATION VARIETY FOR EACH OF THE FOLLOWING CHARACTERS:

CHARACTER	VARIETY	CHARACTER	VARIETY
Winterhardiness	5262	Plant Color	-
Recovery After 1st Cut	5472	Crown Type	5432
Area of Adaptation	5432	Combined Disease Resistance	5364
Flowering Date	-	Combined Insect Resistance	5432

REFERENCES

Barnes, D.K. 1972. A System for Visually Classifying Alfalfa Flower Color. U.S. Dep. Agric. Handb. 424. 18 pp. (Note: Greenish cast of plate 6, A and B is an artifact of printing, actual colors a blend of yellow and white.)

Elgin, J.H., Jr., (ed.). 1982. Standard Tests to Characterize Pest Resistance in Alfalfa Cultivars. U.S. Dep. Agric. Tech. Bull. (In Press).

Gunn, C.R., W.H. Skrdla, and H.C. Spencer. 1978. Classification of *Medicago sativa* L. using legume characters and flower colors. U.S. Dep. Agric. Tech. Bull. 1574. 84 pp.

Munsell Color Co. 1977. Munsell Plant Tissue Color Charts. Munsell Color Co., Inc. Baltimore.

NOTE: Any additional descriptive information and supporting documentation may be provided as Exhibit D.

EXHIBIT D

'5454'

APPLICATION FOR REVIEW OF ALFALFA VARIETIES FOR CERTIFICATION
National Alfalfa Variety Review Board

(The criteria for evaluation of applications were developed by the Joint Alfalfa Work Conference and the Association of Official Seed Certifying Agencies.)

Applicant's Name Pioneer Hi-Bred International, Inc. Date 11-05-91
 Address P.O. Box 287, Johnston, Iowa 50131
 Sponsoring Institution (if other than applicant) _____
 Breeder's Name (if other than applicant) _____
 Variety Name _____ Experimental Designation(s) XAL06, YAL06, 88P1CR2

Applicant's Signature _____

The breeder or sponsoring institution or organization must describe and DOCUMENT in this application those characteristics of the variety which give it distinctiveness and merit by supplying the information requested below. Information must be supplied for each category excepting those listed as optional. Action will be deferred unless the application is sufficiently documented.

At the time a variety is accepted for certification, a seed sample of the generation or generations requested by the certifying agency shall be submitted to the certifying agency by the sponsor. This lot(s) is to be retained as a control sample against which all future seed stocks released for certified seed production may be compared to establish continued trueness of variety.

- I. A. Estimate the % of the germplasm sources listed below that contribute to the major genetic constitution of this variety.

<u>M.falcata</u>	<u>Ladak</u>	<u>M.varia</u>	<u>Turkistan</u>	<u>Flemish</u>	<u>Chilean</u>
<u>2</u>	<u>3</u>	<u>14</u>	<u>2</u>	<u>41</u>	<u>2</u>
<u>Peruvian</u>	<u>Indian</u>	<u>African</u>	<u>Arabian</u>	<u>Unknown</u>	
				<u>36</u>	

- B. A statement of origin (including variety names, germplasm releases and/or PI numbers, and the number of plants or % contribution from each) and the breeding procedures or methods and selection criteria used in developing the variety. Include the procedure for producing breeder seed, the generation (e.g. Syn 1, Syn 2, etc.) that is considered breeder seed, and the year of breeder seed production.

XAL06 is a 12 clone synthetic with clones replicated in "cage isolation". Seed was harvested from each clone and bulked in equal quantities to produce Syn 1 prebreeder seed. Syn 2 seed harvested from 200 random plants in "cage isolation" in 1988 is considered breeder seed. One or more of the parental clones were selected on the basis of clonal evaluation for forage and seed yield, bacterial wilt, anthracnose, Phytophthora root rot, Verticillium wilt, spotted alfalfa aphid, pea aphid and stem nematode. Clonal selection for forage yield was based on OP progeny row tests harvested over several locations. Parental clones trace back through several intermediate experimental lines to Apollo, NCMP-1, Saranac AR, Anchor, Atra 55, 532, 521, 531, 520, 530, DuPuits, Vernal, Narragansett, Culver, Maryland, Dawson, Iroquois, MSA and other germplasms with minor contributions.

C. Seed class to be used, limitations on age of stand and areas of production for each class.

Seed Class	Synthetic Generation	Length of Stand Allowed	Limitation on Acres for Seed Production
Breeder	2	One	None
Foundation	3 or 4	Three	None
Certified	3, 4, or 5	Five	None

Only the synthetic generations given for the above seed classes are recognized as representing this variety. (No supporting data should be used in this application from Syn generations other than those for the Breeder, Foundation and Certified Classes listed here).

D. Procedures for maintaining seed stock:

Breeder seed (Syn 2) produced on 200 plants in "cage isolation" was bulked. Seed classes will be breeder, foundation and certified. Foundation seed may be produced from breeder or foundation. The second generation foundation seed may be produced at the discretion of Pioneer Hi-Bred International, Inc. Both breeder and foundation seed will be maintained by Pioneer Hi-Bred International, Inc. Certified seed may be produced from breeder or foundation.

E. Any other requirements or limitations necessary to maintain varietal characteristics? None

II. A. Describe the primary use of this variety (if for uses other than hay, haylage, greenchop or dehydration):

- B. List states and areas within states where tested for forage and/or persistence. (Present data from each location in III.A. and III.B.). Johnston, IA; Owatonna, MN; Hermiston, OR; Toledo, IA; Phelps, NY; Connell, WA; Lancaster, PA; Quarryville, PA; Moses Lake, WA; Davis, IL; Markesan, WI; Arlington, WI; Princeton, IL; Appleton, WI; Eau Claire, WI.

C. List:

1. Areas of adaptation. North central, east central, winterhardy intermountain
2. Areas of intended use. North central, east central, winterhardy intermountain

III. Evidence of agronomic performance, including data on yield (in T/A) and persistence. Data may be from tests conducted by private firms, Agricultural Experiment Stations or USDA.

- A. Minimum required forage yield data is six location years with at least two locations (two locations must be at least 100 miles apart). Seeding year forage yield data cannot be used to satisfy this requirement. One location must have at least two harvest years beyond seeding year. Each harvest year should be listed separately.

Note: For non-dormant varieties (dormancy level of Moapa 69 or CUF 101) seeding year data may be accepted for up to two of the six location years when four or more cuttings are made in the seeding year.

Summarize Forage Yield Data below:

Test Location	Date Plntd Mo/Yr	Syn Gen	Year Hvst	No. Cuts	This Variety	Total Yield (DM T/A)			LSD .05	CV%
						2. *	3. **	4. ***		
JOHNSTON, IA	4/89	2	90	3	6.7	6.1	5.9	5.8	0.43	4.3
		2	91	4	7.3	6.8	5.5	5.9	0.48	4.4
JOHNSTON, IA	4/90	2	91	4	6.1	5.6	4.6	4.5	0.63	7.0
		2	91	3	5.3	4.6	4.5	4.4	0.52	6.3
OWATONNA, MN	5/89	2	90	3	5.3	4.6	4.5	4.4	0.52	6.3
		2	91	3	5.9	5.3	4.8	4.8	0.59	6.7
OWATONNA, MN	5/90	2	91	3	5.3	5.4	4.7	4.7	0.54	6.3
		2	91	3	5.3	5.4	4.7	4.7	0.54	6.3
HERMISTON OR	4/89	2	90	5	10.8	10.8	8.8	9.7	0.55	3.2
		2	91	5	11.2	10.8	8.1	8.1	0.98	5.9
HERMISTON OR	4/90	2	91	5	11.9	11.8	10.1	10.6	0.88	4.6
		2	91	5	11.9	11.8	10.1	10.6	0.88	4.6
TOLEDO, IA	4/89	2	90	4	8.3	7.4	6.7	6.7	0.78	6.2
		2	91	4	6.9	6.3	5.5	5.9	0.80	8.1

Forage yield data cont.

Test Location	Date Plntd Mo/Yr	Syn Gen	Year Hvst	No.This Cuts	Total Yield (DM T/A) LSD CV% Variety 2. 3. 4. .05	2.	3.	4.	.05	
PHELPS, NY	5/89	2	90	4	6.2	5.3	4.6	4.4	0.51	5.6
		2	91	3	4.3	3.2	2.8	2.2	0.46	8.5
CONNELL, WA	4/89	2	90	5	11.6	10.8	9.5	10.5	0.80	4.4
		2	91	5	11.1	10.1	8.8	9.4	1.28	7.8
CONNELL, WA	4/90	2	91	5	11.2	10.9	9.0	11.7	1.07	6.0
LANCASTER PA	4/89	2	90	4	6.8	6.2	5.0	5.4	0.66	6.5
		2	91	4	6.7	5.8	4.5	4.5	0.87	8.5
LANCASTER PA	6/90	2	91	3	4.0	3.1	3.3	3.7	0.60	9.9
QUARRYVILLE PA	4/89	2	90	5	6.6	5.9	4.0	4.6	0.70	7.3
		2	91	5	5.4	4.6	2.9	3.1	0.76	9.7
QUARRYVILLE PA	4/90	2	91	5	6.2	5.5	4.5	5.4	1.03	11.4
MOSES LAKE WA	4/89	2	90	5	9.7	9.4	7.4	8.4	0.68	4.3
		2	91	4	9.8	9.4	7.0	7.1	0.77	5.1
MOSES LAKE	4/90	2	91	4	10.5	10.5	9.1	9.9	0.85	5.0
DAVIS, IL	4/89	2	90	4	7.7	7.0	6.2	6.7	0.43	3.7
		2	91	4	6.7	6.5	5.9	5.7	0.87	8.4
MARKESAN WI	4/89	2	90	4	7.4	7.1	5.7	6.0	0.47	4.1
		2	91	4	6.3	6.1	5.2	5.8	0.72	6.9
MARKESAN WI	4/90	2	91	3	7.1	6.2	5.5	5.7	0.63	5.9
ARLINGTON WI	4/89	2	90	4	7.2	7.4	5.7	6.7	0.67	5.7
		2	91	4	6.5	6.3	5.0	5.8	0.70	6.6
ARLINGTON WI	4/90	2	91	4	6.4	6.0	5.4	5.9	0.42	4.1
PRINCETON IL	4/89	2	90	4	4.7	4.2	3.8	3.9	0.26	3.8
PRINCETON IL	4/90	2	91	4	7.6	7.1	6.5	6.6	0.61	5.1
APPLETON WI	5/89	2	90	3	7.6	7.5	6.3	6.9	0.67	5.4
APPLETON WI	4/90	2	91	3	5.2	5.1	4.3	4.4	0.48	6.6

Forage yield data cont.

Test Location	Date Plntd Mo/Yr	Syn Gen	Year Hvst	No. This Cuts	Total Yield (DM T/A)					.05
					Variety	LSD 2.	CV% 3.	4.		
EAU CLAIRE WI	5/89	2	90	4	6.0	5.6	5.0	5.1	0.59	6.6
EAU CLAIRE WI	5/90	2	91	3	6.1	5.7	5.4	5.7	0.60	5.2
<hr/>										
* 5432										
** VERNAL										
*** SARANAC										

Mean Annual Yield

	Years Hvstd	Total No. of Hvsts		
Ck 2 comparison	45	161	7.2	6.8
Ck 3 comparison	45	161	7.2	5.8
Ck 4 comparison	45	161	7.2	6.2

B. Persistence (winter and drought tolerance, summer survival relative to check varieties). Enter dates of both Initial and Final stand estimates. Data must come from the area of adaptation and from stands at least two years old. More than one location must be given either when persistence is a trait used to justify release or when large diverse geographic areas of adaption are recommended.

Test Loc.	Syn Gen	Date Seeded (Yr/Mo)	Yrs. Hvtd	No. Hvts	Date of Readings Init/Final (Yr/Mo)	This Variety In/Fnl	%Stand Check Varieties			LSD	CV% .05
							*	**	***		
							In/Fnl	In/Fnl	In/Fnl		
1.	2	89/4	3	9	89/6 91/8	98.6 93.5	99.1 93.1	98.6 91.2	100.0 88.9	2.71 5.89	1.7 3.9
2.	2	89/4	3	10	89/5 91/9	96.8 95.8	95.8 94.9	93.5 78.2	94.4 69.0	4.45 5.83	2.8 3.9
3.	2	89/4	3	12	89/4 91/9	98.2 93.1	98.6 93.1	95.4 84.3	96.3 92.6	3.14 6.50	2.0 4.3
1. JOHNSTON, IA						*	5432				
2. QUARRYVILLE, PA						**	VERNAL				
3. HERMISTON, OR						***	SARANAC				

Scoring System used: Data taken as missing six inch units within each plot with total plot size = 72 units.

- C. Fall dormancy as determined from spaced plantings relative to recognized varieties; check varieties must be chosen so as to bracket the dormancy data of this variety.

1. Test data

Test Location	Syn Gen	Date Last Cut (Yr/Mo)	Date Measured (Yr/Mo)	Score or average height			LSD .05	CV%
				This Variety	Check Varieties 1.	2.		
Johnston, IA	2	90/9	90/10	11.3	8.4	9.7	11.8	1.4 10.0

1. = Vernal
2. = Ranger
3. = Saranac

Scoring system used: Average height in cm of space plants; six replications

2. Indicate which of the following check varieties this variety most nearly compares to in fall dormancy.

VERY DORMANT	DORMANT	MODERATELY DORMANT	NON-DORMANT	VERY NON-DORMANT
Norseman ()	Vernal() Ranger()	Saranac (x) DuPuits () Lahontan ()	Mesilla () Moapa 69()	CUF 101 ()

IV. Other descriptive characteristics

- A. Flower color at full bloom. Syn generation observed
2 (see USDA Agriculture Handbook No. 424 - A System
for Visually Classifying Alfalfa Flower Color).

96 % purple t % cream t % yellow
4 % variegated t % white

- B. (Document other distinctive characteristics such as pod, leaf or root traits, biochemical markers, etc.)

V. Pest Resistance Characteristics

PLEASE FOLLOW THESE INSTRUCTIONS CAREFULLY WHEN REPORTING PEST RESISTANCE RESULTS.

Furnish comparative data on the following insects and diseases (and others where applicable) for your variety. Data may be from tests conducted by private firms, Agricultural Experiment Stations, or USDA. Tests should be conducted by standard procedures as described in ARS Misc. publication 1434. Each disease and insect test must include published resistant and susceptible checks. Statistics must include the test mean (mean of all entries in test), LSD (.05), and CV (%) for unadjusted % resistance and ASI data that are reported. Resistance levels should be characterized using % resistant plants as follows: S=<6%, LR=6-14%, MR=15-30%, R=31-50%, HR=>50%. Do not refer to tolerance. Checks should be characterized based on long term % resistance averages published in ARS Misc. publication 1434. If data for the resistant check does not fit its expected resistance class (MR, R, HR, etc.) data must be adjusted to the long term mean for the published resistant check. If data has been adjusted, supply both adjusted and unadjusted values and indicate how and by whom the adjustment was made.

At the time a variety is accepted for certification, a seed sample of the generation or generations requested by the certifying agency shall be submitted to the certifying agency by the sponsor. This lot(s) is to be retained as a control sample against which all future seed stocks released for certified seed production may be compared to establish continued trueness of variety.

If a scoring or rating system is used, specify the limits and meaning of scores. NOTE: If a pest reaction of the variety falls on or just above a resistance category level (+2% for LR, MR, and R; +3% for HR) and the higher rating is claimed, results of a second test must be reported. If the two tests do not agree, the lower rating is appropriate unless further testing supports the higher rating. Pest resistance data must be submitted on at least six of the following nine pests: anthracnose, bacterial wilt, Fusarium wilt, Verticillium wilt, Phytophthora root rot, stem nematode, pea aphid, spotted alfalfa aphid, and blue alfalfa aphid. For the pests where no data is available enter "Not tested". The six required pests must be selected from those that frequently cause significant losses on susceptible cultivars in the area of intended use of this variety. Show generation of seed used for each test.

15

ANTHRACNOSE (Race 1)

Test conducted by Pioneer Hi-Bred International, Inc. at Johnston, IA

Variety	Resistance Class	Year Tested	Syn Gen	Unadjusted % R	Adjusted % R	Score or A.S.I.
Test Variety	HR	1989	2	51.5	73.0	
1. ARC	HR			45.9	65.0	
2. SARANAC	S			0.0	0.0	
3.						
Test Mean:				30.8	42.7	
L.S.D. (.05)				13.0	18.4	
C.V. (%)				19.0	19.0	

Scoring system used: % surviving seedlings. Data adjusted to ARC at 65% resistant plants by Pioneer Hi-Bred International, Inc.

BACTERIAL WILT

Test conducted by University of Minnesota at Rosemount, MN

Variety	Resistance Class	Year Tested	Syn Gen	Unadjusted % R	Adjusted % R	Score or A.S.I.
Test Variety	R	1991	2	41.6	47.8	2.18
1. VERNAL	R			36.5	42.0	2.22
2. NARRAGANSETT	S			0.7	0.8	4.00
3.						
Test Mean:				47.3	54.5	1.88
L.S.D. (.05)				14.4	16.5	0.45
C.V. (%)				18.8	18.8	14.80

Scoring system used: Plants scored 0 and 1 (on a 0-5 scale, where 0 = no disease, and 5 = dead plant) considered resistant. Data adjusted to Vernal at 42% resistant plants by the University of Minnesota.

FUSARIUM WILTTest conducted by University of Minnesota at Rosemount, MN

Variety	Resistance Class	Year Tested	Syn Gen	Unadjusted % R	Adjusted % R	Score or A.S.I.
Test Variety	HR	1991	2	52.7	59.3	2.37
1. AGATE	HR			48.0	54.0	2.71
2. NARRAGANSETT	MR			20.2	22.7	3.89
3. MNGN-1	S			4.6	5.1	4.69
Test Mean:				53.4	60.0	2.49
L.S.D. (.05)				15.9	17.8	0.66
C.V. (%)				18.5	18.5	16.60

Scoring system used: Plants scored 0 and 1 (on a 0-5 scale where 0 = no disease, and 5 = dead plant) considered resistant. Data adjusted to Agate at 54% resistant plants by the University of Minnesota.

VERTICILLIUM WILTTest conducted by Pioneer Hi-Bred International, Inc. at Arlington, WI

Variety	Resistance Class	Year Tested	Syn Gen	Unadjusted % R	Adjusted % R	Score or A.S.I.
Test Variety	MR	1989	2	17.7	22.8	2.69
1. VERTUS	R			31.0	40.0	3.16
2. SARANAC	S			3.0	3.9	1.60
3.						
Test Mean:				19.9	23.4	2.60
L.S.D. (.05)				11.6	14.9	0.55
C.V. (%)				47.0	47.0	17.00

Scoring system used: Plants scored 5-9 (on a 1-9 scale where 9 = no disease and 1 = dead plant) considered resistant. Data adjusted to Vertus at 40% resistant plants by Pioneer Hi-Bred International, Inc.

PHYTOPHTHORA ROOT ROT

Test conducted by Pioneer Hi-Bred International, Inc. at Quarryville, PA

Variety	Resistance Class	Year Tested	Syn Gen	Unadjusted % R	Adjusted % R	Score or A.S.I.
Test Variety	HR	1989	2	37.6	56.5	
1. AGATE	R			28.7	43.0	
2. SARANAC	S			3.2	4.8	
3.						
Test Mean:				24.0	36.0	
L.S.D. (.05)				11.8	17.7	
C.V. (%)				35.0	35.0	

Scoring system used: % healthy seedlings

STEM NEMATODE

Test conducted by Pioneer Hi-Bred International, Inc. at Connell, WA

Variety	Resistance Class	Year Tested	Syn Gen	Unadjusted % R	Adjusted % R	Score or A.S.I.
Test Variety	MR	1990	2	20.8	28.9	
1. LAHONTAN	R			35.9	50.0	
2. RANGER	S			6.8	9.5	
3.						
Test Mean:				23.6	32.9	
L.S.D. (.05)				7.5	10.5	
C.V. (%)				20.0	20.0	

Scoring system used: Plants scored 5-9 (on a 1-9 scale, where 9 = no symptoms and 1 = dead plant) considered resistant. Data adjusted to Lahontan at 50% resistant plants by Pioneer Hi-Bred International, Inc.

PEA APHID

Test conducted by Pioneer Hi-Bred International, Inc. at Johnston, IA

Variety	Resistance Class	Year Tested	Syn Gen	Unadjusted % R	Adjusted % R	Score or A.S.I.
Test Variety	R	1991	2	44.7	44.3	
1. BAKER	R			45.4	45.0	
2. VERNAL	S			4.0	4.0	
3.						
Test Mean:				36.3	36.0	
L.S.D. (.05)				10.3	10.2	
C.V. (%)				18.0	18.0	

Scoring system used: Plants scored 5-9 (on a 1-9 scale where 9=tall, healthy, plant and 1= dead plant) considered resistant. Data adjusted to Baker at 45% resistant plants by Pioneer Hi-Bred International, Inc.

SPOTTED ALFALFA APHID

Test conducted by Pioneer Hi-Bred International, Inc. at Kerman, CA

Variety	Resistance Class	Year Tested	Syn Gen	Unadjusted % R	Adjusted % R	Score or A.S.I.
Test Variety	R	1991	2	32.0	42.2	
1. BAKER	R			38.0	50.0	
2. ARC	S			0.0	0.0	
3.						
Test Mean:				30.3	39.9	
L.S.D. (.05)				10.9	14.4	
C.V. (%)				23.0	23.0	

Scoring system used: Plants scored 5-9 (on a 1-9 scale where 9 = no damage and 1 = dead plant) considered resistant. Data adjusted to Baker at 50% resistant plants by Pioneer Hi-Bred International, Inc.

BLUE ALFALFA APHID

Test conducted by _____ at _____

Variety	Resistance Class	Year Tested	Syn Gen	Unadjusted % R	Adjusted % R	Score or A.S.I.
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Test Variety			NOT TESTED			
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1.						
2.						
3.						

Test Mean:
L.S.D. (.05)
C.V. (%)

Scoring system used: _____

OTHER PEST EVALUATIONS

APHANOMYCES ROOT ROT

Test conducted by Pioneer Hi-Bred International, Inc. at Arlington, WI

Variety	Resistance Class	Year Tested	Syn Gen	Unadjusted % R	Adjusted % R	Score or A.S.I.
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Test Variety	LR	1990	2	8.9	8.3	3.01
1. WAPH-1	R			53.8	50.0	5.56
2. AGATE	S			1.3	1.2	1.82
3.						

Test Mean:				6.5	6.1	2.30
L.S.D. (.05)				6.5	6.0	0.70
C.V. (%)				71.0	71.0	23.00

Scoring system used: Plants scored 7-9 (on a 1-9 scale where 9 = no disease on roots or hypocotyls and 1 = dead plant) considered resistant. Data adjusted to WAPH-1 at 50% resistant plants by Pioneer Hi-Bred International, Inc.

Please attach a one page description/summary of your variety as you wish it published by AOSCA. This description must stand on its own; please use complete sentences and number each item following the format given below.

Include the following:

1. A statement of genetic origin (including variety names, germplasm releases, and/or PI numbers that contributed to the major genetic constitution of this variety) and the breeding procedures, methods, and selection criteria used in developing the variety. Estimate the % of the major germplasm sources contributing to this cultivar. (see I.A.)
2. Area of probable adaptation and use (geographic area) and primary purpose (hay, grazing, etc.) for which this variety will be used. Report states where the variety has been tested for yield and persistence and proposed areas of intended use.
3. Descriptive characteristics such as fall dormancy, flower color, and any other morphological or physiological characteristics that may be used as identifying traits.
4. A statement relative to the varieties resistance to anthracnose, bacterial wilt, Fusarium wilt, Verticillium wilt, Phytophthora root rot, stem nematode, pea aphid, spotted alfalfa aphid, and blue alfalfa aphid and other evaluated pests.
5. Procedures for maintaining seed stock, seed classes to be used, a statement as to the limitation of age of stand and generations that may be certified and other requirements or limitations necessary to maintain varietal characteristics.
6. If this variety is accepted by official certifying agencies, when will certified seed first be offered for sale?
7. Will application be made for protection under the Plant Variety Protection Act and if so, will the certification option be requested?
8. As a means of added varietal protection, are you willing to have the information in this application turned over to the PVP office?

XAL06

1. XAL06 is a 12 clone synthetic with parents originating from several intermediate experimental lines tracing to Apollo, NCMP-1, Saranac AR, Anchor, Atra 55, 532, 521, 531, 520, 530, DuPuits, Vernal, Narragansett, Culver, Maryland, Dawson, Iroquois, MSA and other germplasms with minor contributions. Parent clones were selected from several experimental populations for one or more of the following: Seed yield, bacterial wilt, anthracnose, Phytophthora root rot, Verticillium wilt, spotted alfalfa aphid, pea aphid and stem nematode. In addition, parental clones were evaluated for forage yield and pest resistance using OP progeny tests at several locations. Germplasm sources are: *M. falcata* (2%), Ladak (3%), *M. varia* (14%), Turkistan (2%), Flemish (41%), Chilean (2%), with (36%) unknown.
2. XAL06 is adapted to and intended for use in the north central, east central and winterhardy intermountain regions of the United States for hay, haylage, greenchop and dehydration. The states in which XAL06 have been tested are: Iowa, Illinois, Minnesota, New York, Pennsylvania, Wisconsin, Oregon and Washington.
3. XAL06 is a moderately dormant cultivar with fall dormancy similar to Saranac. Flower color in the Syn 2 generation is approximately 96% purple, 4% variegated and a trace of yellow, white and cream. Growth habit is erect in midsummer and semi-erect in the fall.
4. XAL06 has high resistance to anthracnose (Race 1), Fusarium wilt and Phytophthora root rot; resistance to bacterial wilt, spotted alfalfa aphid and pea aphid; moderate resistance to Verticillium wilt and stem nematode; low resistance to Aphanomyces root rot (Race 1). XAL06 has not been tested for blue alfalfa aphid.
5. Prebreeders seed (Syn 1) was produced on replicated clones in "cage isolation". Seed was harvested from each clone and bulked in equal quantities. Breeder seed (Syn 2) was produced on 200 randomly selected plants in "cage isolation" and bulked. Seed classes will be breeder, foundation (Syn 3 or Syn 4) and certified (Syn 3, Syn 4, or Syn 5). Foundation seed may be produced from breeder or foundation. The second generation foundation seed may be produced at the discretion of Pioneer Hi-Bred International, Inc. Limitations of age of stand will be three and five years, respectively, for foundation and certified seed.
6. Seed will be marketed in the spring of 1993.
7. Application for Plant Variety Protection will be made and the certification option will not be requested.
8. As a means of added varietal protection, information included with the Application for Review of Alfalfa Variety for Certification may be provided to the PVP office.

9200218

EXHIBIT E

STATEMENT OF THE BASIS OF APPLICANT'S OWNERSHIP

'5454'

Pioneer Hi-Bred International, Inc., Des Moines, Iowa, is the employer of the plant breeders involved in the development and evaluation of 5454. Pioneer Hi-Bred International, Inc. has the sole rights and ownership of 5454.